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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,403	03/26/2004	Dingding Chen	2003-IP-012537 (1391-4930)	3287
30652	7590	10/20/2006	EXAMINER TRAN, MAI T	
CONLEY ROSE, P.C. 5700 GRANITE PARKWAY, SUITE 330 PLANO, TX 75024			ART UNIT 2129	PAPER NUMBER

DATE MAILED: 10/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/811,403		CHEN ET AL.	
	Examiner		Art Unit	
	Mai T. Tran		2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>061704</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is responsive to application 10/811403, filed March 26, 2004.

Claims 1-35 are presented for examination.

CLAIM OBJECTIONS

Claims **2 and 31** are objected to because of the following informalities:

- Claim 2: a period is missing after “objective”.
- Claim 31 is a method claim that depends on an apparatus claim 30. Appropriate correction is required.

CLAIM REJECTIONS - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims **1-35** are rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter.

The claimed invention must be for a practical application by:

1. transforming (physical thing) or
2. having the FINAL RESULT (not the steps) achieve or produce a useful (specific, substantial, AND credible) concrete (substantially repeatable/non-unpredictable), AND tangible (real world/non-abstract) result.

A claim that is so broad that it reads on both statutory and non-statutory subject matter, must be amended, and if the specification discloses a practical application but the claim is broader than the disclosure such that it does not require the practical application, then the claim must be amended.

In the present case, independent claims 1, 18, 32, and 34 are directed to methods and apparatus for generating a neural network ensemble using a genetic algorithm. An invention that comprises “training a set of individual neural networks to produce one or more output values in response to a plurality of input values”, “using a genetic algorithm having a multi-objective fitness function to select at least one ensemble, comprising a subset of the set of individual neural networks, having a desirable fitness function value” has no specific purpose or use.

Claims that recite a computer that solely calculates a mathematical formula are not statutory.

The Examiner reads the claims carefully to search for limitations to practical applications and finds no final result achieved or produced a useful, concrete and tangible result. The claimed invention for generating a neural network ensemble has no real world function and is not statutory.

CLAIM REJECTIONS - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6, 10, 12-13, 15-17, and 32-33 are rejected under 35 U.S.C. 102(b) as being anticipated by “Genetic Algorithm based Selective Neural Network Ensemble” by Zhou et al, hereinafter Zhou.

Claims 1 and 32

Zhou teaches a method for generating a neural network ensemble, comprising:
training a set of individual neural networks to produce one or more output values in response to a plurality of input values (abstract), and
using a genetic algorithm having a multi-objective fitness function to select at least one ensemble, comprising a subset of the set of individual neural networks, having a desirable fitness function value (abstract).

Claims 2 and 33

Zhou teaches a method according to claim 1, wherein the fitness function comprises a negative error correlation objective (page 801, right col., lines 11-13).

Claim 3

Zhou teaches a method according to claim 1, wherein each ensemble comprises five individual neural networks (page 801, left col., line 21).

Claim 4

Zhou teaches a method according to claim 1, further comprising using the genetic algorithm to select a group of ensembles having desirable fitness function values (page 800, left col., lines 35-42).

Claim 5

Zhou teaches a method according to claim 4, further comprising testing one or more of the ensembles from the group of ensembles with data comprising actual input values and output values (page 801, table 1).

Claim 6

Zhou teaches a method according to claim 1, further comprising:
selecting diverse initial parameters for each member of the set of neural networks (page 800, right col.).

Claim 10

Zhou teaches a method according to claim 1, further comprising:
training the individual networks with different training data (page 800, right col.).

Claim 12

Zhou teaches a method according to claim 1, wherein the multi-objective function includes an ensemble mean squared error objective (page 800, right col., last 4 lines).

Claim 13

Zhou teaches a method according to claim 1, wherein the multi-objective function includes a sum squared weights objective (page 799, right col., lines 15-21).

Claim 15

Zhou teaches a method according to claim 1, further comprising normalizing the objectives of the multi-objective function (page 800, left col., lines 35-42).

Claim 16

Zhou teaches a method according to claim 1, further comprising selecting a weighting factor for each objective of the multi-objective function (page 800, left col.).

Claim 17

Zhou teaches a method according to claim 16, further comprising using a genetic algorithm to select the weighting factors (page 800, left col.).

CLAIM REJECTIONS - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims **11, 14, and 34-35** are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhou as applied to claims 1-6, 10, 12-13, 15-17, and 32-33 above, and further in view of “Modeling of Sonic Logs in Oil Wells with Neural Networks Ensembles”, Granitto et al, hereinafter Granitto.

Zhou teaches substantially all of applicants’ claimed invention but fail to disclose the different training data is data from different wells as in **claim 11**.

Granitto discloses neural network ensembles in the modeling of oil well logs (abstract) uses data from different wells (page 2, line 26).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine the method of generating a neural network ensemble of Zhou with Granitto’s use of data from different wells.

The motivation for doing so would be to show that neural network ensemble are clearly superior as modeling technique between the correlated variables (Granitto, abstract).

Regarding **claim 14**, Granitto discloses the individual neural networks are trained to produce as outputs predicted open hole logging parameters in response to inputs comprising pulsed neutron logging parameters (page 1, paragraph 1).

Regarding **claim 34**, Granitto discloses training a set of individual neural networks to produce one or more output values in response to a pulsed neutron well log input data (page 1, paragraph 1).

Claims **18-31** are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhou as applied to claims 1-9, 12-14, and 16-17 above, and further in view of Mezzatesta et al, U. S. Patent No. 5,862,513, hereinafter Mezzatesta.

Zhou teaches substantially all of applicants' claimed invention but fail to disclose producing as outputs synthetic values of at least one geophysical parameter for a well in response to inputs of actual values of geophysical parameters measured in the well.

Mezzatesta discloses an apparatus for producing synthetic tool response for a well logging tool (abstract), which uses an ANN (col. 3, line 28).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine the apparatus of Zhou with Mezzatesta.

The motivation for doing so would be to reduce or eliminate the need for tedious numerical calculations related to tool measurements (Mezzatesta, col. 3, lines 34-36).

CONCLUSION

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

1. Wiener et al, U. S. Patent No. 5,251,286, discloses method for estimating formation permeability from wireline logs using neural networks.
2. Hoskins et al, U. S. Patent No. 5,444,619, discloses system and method of predicting reservoir properties.

3. Callender et al, U. S. Patent No. 5,828,981, discloses generating pore types and synthetic capillary pressure curves from wireline logs using neural networks.
4. Schultz et al, US-PGPub 2002/0152030, discloses downhole sensing and flow control utilizing neural networks.
5. "Modular artificial neural network for prediction of petrophysical properties from well log data", C. C. Fung, K. W. Wong, H. Eren, R. Charlebois, H. Crocket, IEEE Instrumentation and Measurement Tech Conf, 1996.
6. "Ensemble learning via negative correlation", Y. Liu, X. Yao, Neural Networks, Volume 12, Issue 10 (December 1999), pages: 1399-1404.
7. "A Genetic Algorithm Approach for Creating Neural-Network Ensembles", D. W. Opitz, J. W. Shavlik, Combining Artificial Neural Nets, pages 79-99. Springer-Verlag, London, 1999. <http://citeseer.ist.psu.edu/opitz99genetic.html>
8. "Evolutionary ensembles with negative correlation learning", Y. Liu, X. Yao, T. Higuchi, IEEE Transactions on Evolutionary Computation, Nov 2000, Vol. 4, No. 4, pages: 380-387.
9. "Negative Correlation Learning and the Ambiguity Family of Ensemble Methods", G. Brown, J. Wyatt, Springer-Verlag Berlin Heidelberg 2003.


CORRESPONDENCE INFORMATION

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mai T. Tran whose telephone number is (571) 272-4238. The examiner can normally be reached on M-F 9:00am-- 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Vincent can be reached on 571-272-3080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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